

gradually. Before the point of saturation is attained the solution will deposit the citrate of zinc as an insoluble powder. This is to be collected on a filter, and having ascertained by drying a weighed portion of the mass at  $212^{\circ}$  how much is equivalent to one ounce of dry citrate, this quantity is to be heated in a capsule with the citrate of iron and ten ounces of water. When the iron salt is dissolved, enough solution of ammonia is to be added to effect solution of the citrate of zinc, an excess of ammonia being avoided. The whole is now evaporated to a syrupy consistence, and spread on glass to dry in scales.

*Physical characters.*—Brownish-green scales. Taste ferruginous and slightly "metallic."

*Chemistry.*—This salt contains in addition to the citrates of iron and zinc, ammonia, and would therefore be more properly named ammonio-citrate of iron and zinc. Its composition as found in commerce is very variable.

*Physiological action and therapeutical use.*—This salt is occasionally employed as a tonic in cases where the use of iron is not contraindicated. As an elegant form of administering zinc it is worthy of trial in diseases of the nervous system.

*Dose.*—Two to five grains.

12. *Is Alcohol Food?*—Dr. THOMAS INMAN read before the 30th annual meeting of the British Medical Association a paper on this much disputed question.

The following is a summary of the facts which he considers that he has elicited:—

"1. Nature has provided in the salivary glands, the liver, and the lungs of every mammal, an apparatus for converting all food, especially farinaceous, into alcohol; and we have no evidence that such conversion does not take place.

"2. One form of alcohol or another is available for the support of life—and for restoration to health when no ordinary food is or can be digested.

"3. Alcohol, after being taken, is incorporated with the blood, passes into the various tissues, and ultimately disappears, a small portion only passing away in the breath. We can say no more of bread, potatoes, or oatmeal porridge, a small portion of each of which passes out of the body with the feces.

"4. Alcohol, in the form of ale, porter, wine, etc., relieves hunger and quenches thirst simultaneously, and with a completeness that is not equalled by water, infusion of gentian, cayenne pepper, or by turpentine; *i. e.*, it does not act as water simply, or as a stimulant alone.

"5. Wine, beer, etc., satisfy the appetite when taken alone, and act for some time like any solid food would do.

"6. When alcohol is mingled with other food, a less amount of the latter suffices for the wants of the system than if water had been used as the drink.

"7. The various forms in which alcohol is taken, have as marked and specific effects as have animal and vegetable articles of diet.

"Individuals have subsisted wholly upon one or other of the various forms of alcohol in common use for periods of great length; and, as it is illogical to conclude that they must have lived on air, without food, or on flies like chameleons, the conclusion is irresistible.

"What that conclusion is, we fearlessly leave every thinking man to decide."  
—*British Med. Journ.*, Oct. 4, 1862.

## MEDICAL PATHOLOGY AND THERAPEUTICS, AND PRACTICAL MEDICINE.

13. *Diseases depending on Morbific Fermentation, and their Treatment.*—In our number for Oct. last (pp. 513–15) we laid before our readers an account of some researches by Prof. G. POLLI, regarding the therapeutical powers of a new series of salts, the sulphites. We find in a late number of the *Dublin Quarterly*

*Journ. of Med. Sci.* (May, 1862) a review of a most interesting monograph by the same Professor on zymotic diseases, strictly speaking; or on such diseases as date their existence from the presence of a fermenting or catalytic principle, either generated spontaneously in the system, or introduced from without. Not having yet received this monograph, and believing that the author's researches are of great importance, we extract from the above alluded to review the following notice of them:—

If the author's experiments can be relied on, and they seem to have been conducted with great sagacity and care, zymotic diseases would be no longer fatal, but would be as amenable to treatment as many other ailments of daily occurrence, and the remedies which cure those fatal diseases, when developed, would, in addition, seem to be capable of acting as prophylactics against them.

Dr. Polli commences his monograph by establishing the great importance of fermentation in catalytic actions; he says:—

"By catalysis, fatty principles which are insoluble are rendered soluble (glycerine, for instance); some bitter principles, as salicine, are rendered sweet (glucose); some inodorous substances, myrotic acid, for instance, are changed into odorous essences (oil of mustard); many neutral substances, as urea and allantoin, are changed into energetic alkalies (ammonia); some inert principles, or of weak nutrient capacity, as starch, are changed into inebriating substances (alcohol); and, finally, some principles of very slight action on the human economy, as amygdaline, are changed into energetic poisons (oil of bitter almonds and prussic acid.)"

Further on he says:—

"Different putrescible organic substances will, therefore, be capable of producing divers *morbific ferments*, or, perhaps, even the one organic principle, during different stages of its decomposition, may be capable of producing the same varied effects; and if, in a healthy animal, some such putrescible substance should be introduced, either by the lungs, the gastro-enteric tube, or by the cutis, or by injection, or by inoculation, such substance being in a state of decomposition, different from that which should correspond with a normal physiological metamorphosis, its introduction would give rise to serious disturbance in the composition of one or more of the fermentable components of the body; in such cases the *morbific ferment* would be introduced from without. But should the natural metamorphosis of the putrescible substances of our organism deviate from its normal course, either in consequence of atmospheric vicissitudes, great fatigues, insufficient exercise, mental anxieties, or in consequence of suppressed secretions or excretions, such deviations may give rise to compounds capable of effecting abnormal modifications in the putrescible components of our body, and in this case the *morbific ferment* would originate within the living frame. . . . The change which takes place in the human economy, in either of these cases, is simply due to a catalytic action; I shall, therefore, for the sake of brevity, and also, at the same time to indicate their proximate causes, name all diseases arising in such manner *catalytic diseases*. Catalytic diseases are truly diseases of blood poisoning, for it is in the blood that the morbid ferments are generated, or introduced. . . . I shall illustrate this operation by quoting some experiments of Schmidt (*Ann. di Chim. appl. alla Med.*, vol. xxiv. p. 59). Blood, fresh drawn from the vein of a healthy man, will not cause either sugar, urea, amygdaline, nor asparagine to ferment. If the same blood be left exposed to the air for a few days, a principle will develop itself in it which will be capable of determining alcoholic fermentation in saccharine substances; and after fourteen days' exposure another principle, capable of causing both urea and asparagine to ferment, will be formed. Such blood, however, kept ever so long, will not become capable of inducing amygdaline to ferment.

"Blood drawn from the veins of persons laboring under various diseases, including cholera, induces fermentation in a few hours, not only in sugar and urea, but also in amygdaline.

"From these experiments, I conclude that the albuminoids of the blood can, under certain conditions, undergo such change as to give origin to specific ferments which do not exist in normal healthy blood; and that during certain

diseases it not only has a greater tendency to produce these ferments, but will even give rise to others, both different and more active than such as would arise from the simple spontaneous alteration of normal blood.

"Experiments carefully practised on animals have given the following important results:—

"1st. That the injection of a certain quantity of pus into the circulation produces pyemia, and such diseases as are characterized by multiple abscesses.

"2d. That the injection of putrid matter produces septicemia, or those diseases recognized by the name of putrid infections, and which are characterized by typhoid gastro-enteritis.

"3d. That the injection of matter obtained from contagious diseases, glanders, for instance, will reproduce the same affections.

"The injection of from two to four grammes of corrupted human pus into the veins of a dog of medium size, and weighing about six or seven kilogrammes, almost always induces vomiting, after a few moments, often followed by alvine dejections. The dog looks stupid and weary, and stretches itself on its side, its breathing gets hurried, it will neither eat nor drink, and thus it remains for two or three days. If the lesser quantity (viz., two grammes) of pus have been injected, then the dog about the third day commences to improve; it will take a little food, will move itself a little, and altogether look more lively, and by the ninth or tenth day it will be so much better as to be considered quite convalescent; the wound also, through which the injection was practised, and which, at the commencement, had suppurated and spread itself, will now have begun to get small, and will show symptoms of cicatrization. If, however, the larger quantity (four grammes) shall have been injected, the dog will become daily worse, presenting all the symptoms and running through all the stages of typhoid fever; it will keep constantly lying down in its kennel, in a sort of stupor; it will take no food; it often suffers from bloody stools; the wound through which the injection was practised becomes livid and gangrenous, and the dog dies between the fifth and seventh day after the operation. At the *post-mortem* examination the gastro-enteric tube is found in a general state of inflammation, the mucous membrane of a dark red color, here and there dotted with puriform exudation, at times mixed with ulcerations, especially in the neighbourhood of the pylorus, and in the cæcum; the lungs are found full of ecchymotic spots, and the blood contained in the larger vessels and in the right cavities of the heart, is tarry and liquid.

"The injection of from one to three grammes of putrid blood into the veins of a dog, produces a typhoid disease, very similar to that produced by the injection of pus, but of much more serious character. If the lesser quantity be injected, the dog rarely vomits, but remains stupid and motionless, standing on its four legs, hangs its head down, and will remain so, at times, for hours; eventually it lies down, and for several days it will neither eat nor drink, the wound, during this time, becoming large, livid, and sanious. By slow degrees, in the course of eight or ten days, the dog improves, but during its entire illness its complete prostration of strength, together with its comatose state, fully recall to one's mind the characteristics of adynamic fevers.

"If, however, the larger quantity of putrid blood, viz., three grammes, have been injected, the dog both vomits and defecates, generally within a few minutes, and the successive conditions of stupidity, prostration, and coma are more strongly marked; the dog lies on his side, with his legs stretched out, as also his head and neck; the wound assumes a sanious and often a gangrenous appearance, and about the third, fourth, or fifth day after the injection, the dog dies. At the *post-mortem* examination the entire gastro-intestinal tract exhibits the appearance of a violent attack of gastro-enteritis, the mucous membrane of the stomach and the intestines being deeply injected, dark red, and in some spots ecchymotic and bloody, the most inflamed portions being the stomach, in the vicinity of the pylorus, the duodenum, and the rectum.

"The injection into the veins of a dog of the discharge collected from the nares of a glandered horse, even where only the small quantity of *half a gramme* is used, gives rise to the following phenomena. Immediately after the operation the dog generally vomits; this is followed by utter prostration of strength.

laboured respiration, distaste for food, rapid wasting away, the formation, here and there, under the skin and between the muscles, of numerous unhealthy (*marciosi, putrid*) abscesses, which, when laid open, exhibit a lardaceous base, analogous to syphilitic ulcers in the human body; after death numerous clots are found in the lungs much more numerous and better marked than in the case where pus was injected. These are not merely ecchymotic stains, but real clots, often softened in the centre, and even at times converted into purulent cavities.

"The summary conclusion of my experiments, of which I have now only given a slight sketch, is, therefore, that by means of injections into the blood, with the above-mentioned morbid matters, very serious and well marked forms of disease can be produced, exhibiting all the general characters of catalytic diseases."

Once admitted that catalytic diseases depend on the presence and action of specific ferments in the blood, the question then arises, whether it would be possible to neutralize them, and render them inactive, when once introduced or self-developed in the living body. Dr. Polli answers in the affirmative, notwithstanding the assertion of Claude Bernard (whom he calls the greatest living physiologist), who, after establishing the fact that fermentation may arise in the blood, and give origin to poisonous principles, which may, in their turn, produce certain grave accidents in the living frame, adds: "*La neutralization des ferments est impossible, parce que pour cela, il faudrait changer les propriétés du sang à tel point, que la vie ne serait plus possible.*" (*Leçons sur les effets des substances toxiques et medicamentouses*, p. 99.)"

Dr. Polli believes that we possess in sulphurous acid, when combined with salifiable bases, a means of controlling and neutralizing morbid ferments in the blood of living animals, without in any way vitiating its qualities so as to render it incapable of maintaining life. After carefully studying the action of sulphurous acid on organic matters, and fermenting principles in particular, our author came to the conclusion that not only it alone, but also its combinations with earths and alkalies, such as the sulphites of soda, potash, magnesia, and lime, possess, in a supreme degree, the power of arresting all known organic fermentations and putrefactive metamorphoses of animal solids and liquids; and that its action does not depend on its decomposing the fermenting principle, but simply by modifying its molecular aggregation, so that it never acts as a poison on the living organism, as do many other substances, well known for their antiseptic properties, but which, on account of their poisonous effects, cannot be employed with safety. He says:—

"I made several experiments with healthy dogs, for the purpose of determining the quantity of sulphites of soda, potash, magnesia, or lime which could be safely administered, and I found that a dog weighing from seven to eight kilogrammes, could not only take with perfect safety from one to fifteen grammes of such salts, but also without the slightest inconvenience; and a dog of about the same weight took during fifteen successive days as much as ten grammes of these salts daily. Sulphite of lime appears to be even better tolerated, as on one occasion I gave to a dog of about eight kilogrammes weight as much as fifteen grammes of it at a dose, and it did not appear to suffer the least inconvenience. I killed several healthy dogs during these experiments, for the purpose of examining the state of their stomach and intestines, and I constantly found them in a perfectly normal condition.

"Having thus determined the harmless action of these salts, I endeavoured to trace their course through the living organism, and determine, if possible, by what way and in what condition they are eliminated from the system, and I found that they remain as sulphites much longer than might have been supposed from their aptitude to become sulphates during the oxidizing process of life. I found *sulphites* in the urine for many hours after their ingestion, and not sooner than after a lapse of twenty-four hours did I find them in the urine as *sulphates*. The following experiment will prove interesting: I took three dogs in good health, and of about the same weight and stature; to one I gave fifteen grammes of sulphite of soda, in the course of twenty-four hours, one gramme at a time, wrapped up in a pellet of sausage meat; to another I gave fifteen grammes of sulphite of magnesia in the same way; and to the last I gave the same food, but

no sulphites. The three dogs were put to death at the same time; I collected the blood and the urine of each separately, together with the liver and one hind leg without the skin. I easily detected the presence of the sulphites in every one of the fluids and solids of the dogs to whom they had been administered, while I failed in detecting even a trace of sulphurous acid in the remains of the third dog. All these samples, liquid and solid, were then left exposed at a temperature varying from  $12^{\circ}$  to  $15^{\circ}$  centigrade, and after five days the urine of the third dog exhibited a highly ammoniacal odour, and its liver and leg gave evidence, by their smell, of impending decomposition, while those parts which had been taken from the dogs who had received the sulphites still remained perfectly fresh.

"These results confirmed my theoretic opinions, and I concluded that if sulphites taken by the mouth could so modify the tissues of a living animal, as to give them the power of resisting for a longer period the putrefactive fermentation after death, so might the presence of these same sulphites in the living tissues enable them to assist during life the action of those morbid ferments which constitute the essence of catalytic disease."

In the *British Medical Journal* (Jan. 3, 1863) it is stated that M. BURGGRAEVE has put into practice the theory of Dr. Polli—the employment of the sulphites in supposed cases of morbid ferments in the blood. M. Burggraevé has communicated to the Belgian Academy of Medicine his experience in the use of these agents in cases of wounds, abscesses, and burns. The sulphite of magnesia is administered internally—one *gramme* (fifteen grains), in a glass of sugared water four or six times a day. The sulphite of soda is employed externally, in lotions, etc. It produces, we are told, immediate local anæsthesia, which is particularly appreciated in burns, and allows of their being dressed and cauterized without pain. In sixty-five cases of wounds thus treated the effects produced were immediate; the wounds improved and became of a healthy colour; active granulation took place; the pus was scanty, inodorous, and tough as gluten. The application thus also acted as a disinfectant.

Dr. LYELL, of Fifeshire, in a letter in this last-named journal (Jan. 31, 1863) states that he has been induced by the experiments of Dr. Polli to try the sulphite of soda in diphtheria, and the improvement after the use of the salt was very marked. He dissolved half an ounce of the sulphite of soda in four ounces of water, and gave the solution in doses of a tablespoonful every four or six hours.

14. *The Fermentative Theory of Disease.*—In a recent clinical lecture on Puerperal Purulent Infection, M. TROUSSEAU, in discussing the etiology of the disease, gives the following *résumé* of M. Pasteur's important observations relative to the origin of fermentations. The discoveries made by this *savant* concerning the organic corpuscles contained in the air furnish us with certain theoretical and practical facts worthy of consideration in relation to the etiology of purulent infection.

M. Pasteur's investigations of the doctrines of ferments and of spontaneous generation led him to conclusions totally different from those previously accepted in science. He noticed that all fermentations properly so called—the lactic, butyric fermentations, for example—were always associated with the presence and with the multiplication of organized beings. According to his views, the albuminoid matters do not constitute the ferments, but are the aliments supplying the materials of growth to the ferments. The true and actual ferments are certain organized entities. But, it will be asked, from whence are these organized beings derived? What is their source?

To learn this, M. Pasteur first of all proceeded to analyze the air, in order to ascertain whether or not these beings were present in the air. For this object, he made use of an apparatus which allowed a large quantity of air to pass through a peculiar kind of filter. The filter, which in fact was formed of gun-cotton, retained all the particles floating in the air, whether vegetable, animal, or mineral. The gun-cotton, thus charged with matters, was then dissolved in a mixture of alcohol and ether. The menstruum was then evaporated; so that,